UNIVERSITY
— OF —
JOHANNESBURG

PROGRAM	: NATIONAL DIPLOMA EXTRACTION METALLURGY
SUBJECT	: **MINERAL PROCESSING III**
CODE	: **MPR 32 – 1**
DATE	: WINTER EXAMINATIONS 2018 07 JUNE 2018
DURATION	: (SESSION 2). 12:30– 15:30
WEIGHT	: 40: 60
TOTAL MARKS	: 93
FULL MARKS	: 100

EXAMINER	: DR W. NHETA
MODERATOR	: DR E. MATINDE
NUMBER OF PAGES	: 3 PAGES

INSTRUCTIONS	: ANSWER ALL QUESTIONS. DRAW NEAT DIAGRAMS AND WRITE CLEARLY. MARKS CAN BE DEDUCTED FOR UNTIDY WORK. FOR THE CALCULATION QUESTIONS, PUT ALL YOUR FINAL ANSWERS AT THE END OF EACH QUESTION. ENSURE THEY ARE CORRECTLY NUMBERED. USE 4 DIGITS IN ALL CALCULATIONS UNLESS STATED OTHERWISE. PUT ALL YOUR WORKING IN THE SCRIPT. NO VISIBLE WORKING IN THE SCRIPT MEANS NO MARKS WILL BE AWARDED.

Question 1

An ore contains galena (PbS), silver (Ag) and dolomite ($CaMg(CO_3)_2$)
It is treated in a flotation plant to produce a concentrate and tailings.
The ore contains 9.253% galena, 12.02t/hr Pb and 10g/t Ag.
Of the silver, 30% is free, and 60% is associated with the galena.
The concentrate contains 10% of the flotation feed mass and has a grade of 74.53%Pb.
The free silver grade in the concentrate is 27g/t Ag

Calculate:-

1.1.	The mass of the feed t/hr	(3)
1.2.	The total Ag grade in the concentrate	(3)
1.3.	The total Ag recovery to the concentrate	(3)
1.4.	The grade of free Ag in the tailings	(3)
1.5.	The % of the lead in the feed recovered to the concentrate	(3)
	Pb – 207.2 S – 32.1	**[15]**

Question 2

A sphalerite (ZnS)- quartz ore contains 10%Zn. After crushing it is fed at the rate of 200t/hr to a 5mm screen. The screen undersize contains 15% of the sphalerite in the screen feed at a grade of 14.43%Zn.
The screen oversize is fed to a DMS circuit. 30% of the quartz in the screen feed goes to the floats at an SG of 2.65.
The DMS sinks join the screen undersize to form the flotation feed. After further crushing and grinding, this stream is floated and a concentrate produced. It has a mass of 30t/hr and contains 90% of the sphalerite in the flotation feed.

Calculate:

2.1 the mass of solids in the flotation feed.	(2)
2.2 the % quartz in the screen undersize	(3)
2.3 the % Zn in the DMS sinks	(4)
2.4 the SG of the dry solids in the DMS sinks	(4)
2.5 the %Zn in the flotation concentrate	(4)
2.6 the %Zn recovery to the flotation concentrate from the flotation feed	(2)
	[20]

Zn – 65.4   S – 32.1
SG sphalerite – 4.0   SG quartz – 2.65

Question 3

A company has a resource of 30million tons of ore that it wishes to treat at a rate of 65 000 tons/month. The ore has a solid density of $2.68t/m^3$. When it is deposited on the dam, the material will contain an average of 84% solids. In order to meet the Mine's Inspector's limitations of a final height of 60m and a maximum rate of rise of 1.5m/year,

3.1 What area of land needs to be purchased to the nearest $10\ 000m^2$ (8)

3.2 If the only area available is $10\ 000m^2$ less than what is
    required, what can the company do to still meet the requirements
    of the Inspector of Mines.   (2)
                                                                                        [10]

Question 4

4.1 In froth flotation, what are the two methods by which collectors coat mineral surfaces?
                                                                                        (2)
4.2 Describe how one works for oxides and silicates   (1)
4.3 How does the other one work for sulphides?   (1)
4.4 Describe two methods by which sulphides can be collected using Xanthate.
    (Include the formulae for the reactions)   (8)
4.5 Why does sphalerite not float with xanthates?   (2)
4.6 How can it be made to float? (Include the reactions)   (6)

                                                                                        [20]

Question 5

5.1 Apart from low cost, discuss the five desirable properties for the solid medium in
    Dense Media Separation (DMS)   (14)

                                                                                        [14]

Question 6

Describe how a jig works. Include the types of concentration processes.   (14)
                                                                                        [14]